

## CLAIMS

What is claimed is:

1. A high-efficiency power supply apparatus used with a driving system driving a display panel, comprising:
  - a direct current power supplying circuit to improve a power factor by rectifying an alternating current power, and generating a direct current power not isolated from the alternating current power, and a direct current power isolated from the alternating current power;
  - a display panel driving circuit to generate various driving signals to drive the display panel with the non-isolated direct current power; and
  - a video signal processing circuit to perform a predetermined video signal processing to generate data to drive the display panel with the isolated direct current power.
2. The apparatus of claim 1, wherein the direct current power supplying circuit comprises:
  - a rectifier circuit to rectify the AC power and to output the AC source as a direct current voltage;
  - a power factor correction circuit to receive the output of the rectifier circuit, to improve the power factor, and to generate the non-isolated direct current power which is not isolated from the alternating current power; and
  - a direct current-direct current conversion circuit to receive the non-isolated DC power and to convert the received non-isolated DC power into the isolated direct power having a predetermined level isolated from the alternating current power.
3. The apparatus of claim 2, wherein the power factor correction circuit includes a converter to control a level of the output voltage.
4. The apparatus of claim 3, wherein the converter includes a single ended primary inductance converter (SEPIC).
5. The apparatus of claim 2, wherein the direct current supplying circuit further comprises a ripple filter to filter a ripple by inputting the output of the power factor correction circuit.

6. The apparatus of claim 5, wherein the ripple filter includes a serial type switching ripple filter.

7. The apparatus of claim 1, wherein the display panel includes a plasma display panel.

8. The apparatus of claim 1, wherein the display panel driving circuit includes a sustain driving circuit of the plasma display panel.

9. The apparatus of claim 1, wherein the data generated by the video signal processing circuit is transferred to the display panel driving circuit through a photocoupler.

10. The apparatus of claim 1, wherein an output end ground (first ground) of the circuit generating non-isolated direct current power in the direct current power supplying circuit and a ground (first ground) of the display panel driving circuit are connected to each other, an output end ground (second ground) of the circuit generating isolated direct current power in the direct current power supplying circuit and a ground (second ground) of the video signal processing circuit are connected to each other, and the first grounds and the second grounds are electrically blocked from each other.

11. A method of designing a high-efficiency power supply apparatus used with a display panel driving system of a display panel, comprising:

providing a non-isolated direct current power which is not isolated from input alternating current power directly to a display panel driving circuit;

providing an isolated direct current power which is isolated from the input alternating current power to a video signal processing circuit which performs a predetermined video signal process to generate data used to drive a display panel; and

isolating the display panel driving circuit and the video signal processing circuit.

12. The method of claim 11, wherein a ground (first ground) of the circuit generating non-isolated direct current power in the direct current power supplying circuit and a ground (first ground) of the display panel driving circuit are connected to each other, a ground (second ground) of the circuit generating isolated direct current power in the direct current power supplying circuit and a ground (second ground) of the video signal processing circuit are

connected to each other, and the first grounds and the second grounds are electrically blocked from each other.

13. The method of claim 11, wherein the non-isolated direct current power is an output power of a power factor correction circuit.

14. The method of claim 11, wherein the non-isolated direct current power is an output power passed through the power factor correction circuit and a ripple filter.

15. The method of claim 11, wherein the data generated by the video signal processing circuit is transferred to the display panel driving circuit through a photocoupler.

16. The method of claim 11, wherein the display panel includes a plasma display panel.

17. The method of claim 11, wherein the display panel driving circuit includes a sustain driving circuit of the plasma display panel.

18. A display panel driving system having a video signal processing circuit and a display panel driving circuit to drive a display panel, comprising:

a power supply unit generating a non-isolated power to the display panel driving circuit and an isolated power to the video signal processing circuit, wherein the non-isolated power is isolated from the isolated power so that the display panel driving circuit is isolated from the video signal processing circuit.

19. The system of claim 18, wherein the display panel driving circuit comprises a sustain driving circuit connected to a first ground potential, and the video signal processing circuit connected to a second ground potential which is isolated from the first ground potential.

20. The system of claim 18, further comprising:

a DC-DC conversion circuit coupled between the power supply unit and the video signal processing circuit, wherein the power supply unit comprises a circuit receiving an AC power and outputting a DC power, and the DC power is transmitted to the video signal processing circuit through the DC-DC conversion circuit and directly to the display panel driving circuit.

21. The system of claim 20, wherein the display panel driving circuit and the DC-DC conversion circuit are connected to a first ground potential, and the video signal processing circuit is connected to a second ground potential which is isolated from the first ground potential.

22. The system of claim 21, further comprising:  
a high voltage outputting circuit supplying a high voltage to the display panel and connected to the first ground potential; and  
a converter connected between the high voltage outputting circuit having primary and secondary coils connected to the first ground potential.

23. The system of claim 21, further comprising:  
a photocoupler coupled between the video signal processing circuit and the display panel driving circuit and connected to the second ground potential.

24. The system of claim 23, further comprising:  
a logic circuit coupled to the photocoupler to transmit data generated from the video processing circuit to the display panel driving circuit; and  
a converter coupled between the logic and the DC-DC converter, and coupled to the second ground potential.

25. The system of claim 18, wherein the display panel is a plasma display panel (PDP) receiving data from the video signal processing circuit and a driving signal from the display panel driving circuit according to the data, and the system does not have a DC-DC conversion circuit connected between the power supply apparatus and the display panel driving circuit so that the non-isolated power is supplied directly to the display panel driving circuit.

26. A method of driving a display panel in a display panel driving system having a video signal processing circuit and a display panel driving circuit, the method comprising:  
generating a non-isolated direct current power and an isolated direct current power from an input alternating current power; and  
supplying the non-isolated direct current power to the display panel driving circuit and the isolated direct current power to the video signal processing circuit.

27. The method of claim 26, further comprising:  
isolating the display panel driving circuit from the video signal processing circuit.